Corresponds to SE 505141

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INTERNATIONAL APPLICATION PUBLISHED UNDER THE PATENT COOPERATION TREATY (PCT)

(51) International Patent Classification 6 : D21C 9/147	A1	(11) International Publication Number: WO 97/15715
		(43) International Publication Date: 1 May 1997 (01.05.97)

(21) International Application Number: PCT/SE96/01154

(22) International Filing Date: 18 September 1996 (18.09.96)

(30) Priority Data:
9503720-6 23 October 1995 (23.10.95) SE

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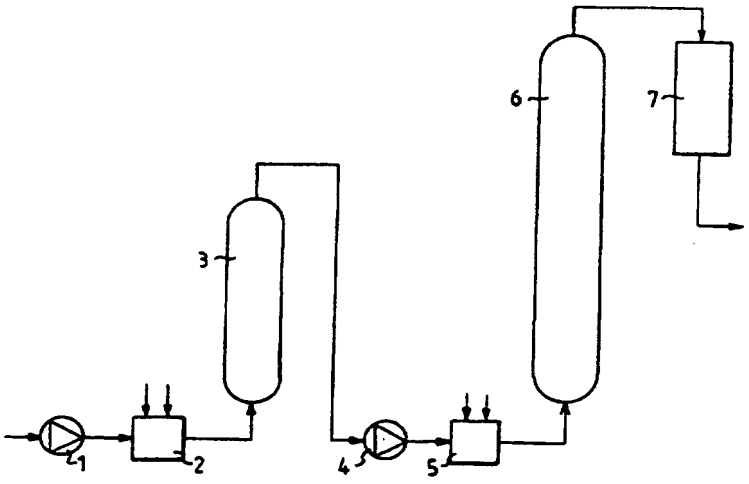
(81) Designated States: AU, BR, CA, CN, JP, NO, NZ, RU, European patent (AT, BE, CH, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE).

Published
With international search report.

(54) Title: OXYGEN DELIGNIFICATION OF LIGNOCELLULOSIC PULP IN TWO STEPS



(57) Abstract

A method f oxygen delignification f pulp from lignocellulosic material at medium concentration in two steps. An extended delignification is obtained in that the temperature in the first step is held bel w 90 °C, that the difference in temperature between the steps is lower than 20 °C. The pressure in the first step is 4-10 bar and in the second step 2-5 bar, and the pressure in the first step is higher than in the second step. The oxygen addition to the first step is high, 25-50 kg/ton pulp, that alkali is added only to the first step for obtaining high alkalinity in the pulp, 25-50 kg alkali per ton pulp. The stay-time in the first step is 10-30 min and in the second step 45-180 min.

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OXYGEN DELIGNIFICATION OF LIGNOCELLULOSIC PULP IN TWO STEPS

This invention relates to a method of oxygen delignification of lignocellulosic material at medium concentration, i.e. 8-16%.

Since the introduction of oxygen delignification at medium pulp concentration not much development work has been devoted to this process. Since chlorine free bleaching and the closing of bleach plants have become a matter of current interest, extended delignification, i.e. a further lowering of the kappa number, by means of oxygen has increasingly become more interesting. Extended delignification by oxygen in one or several steps, however, can result in deteriorated pulp quality. Right conditions, however, can yield several advantages.

It should be possible to maintain the yield of the pulp better than at extended cooking, i.e. cooking to lower kappa number.

At a multi-step method it should be possible to distribute the chemicals between the steps in order to obtain optimum conditions in every step. Even other conditions could then be optimized.

The present invention relates to a method of extended oxygen delignification so that a lower kappa number is obtained without thereby deteriorating the properties of the pulp. By extended delignification according to the invention, the total delignification can amount to 50-70% of the lignin content (kappa number) of unbleached pulp. The method is carried out at medium pulp concentration in two subsequent steps. The characterizing features of the invention are apparent from the attached claims.

The invention is described in greater detail in the following with reference to the accompanying Figure illustrating schematically an installation for carrying out the method according to the invention.

At the installation shown, digested pulp at medium concentration, i.e. 8-16%, is pumped by a first pump 1 from brown pulp washing to oxygen delignification. A first mixer 2 is used for admixing oxygen

and alkali to the pulp. The pulp is thereafter fed into a first reactor 3, in which the first delignification is carried out. The pulp is directed from there, possibly by a second pump 4, via a second mixer 5 for admixing steam and possibly additional oxygen to a second reactor 6 for the second delignification step. After the second reactor 6 the pulp is fed to a blow tank 7 and from there to subsequent processing steps.

The method, thus, implies that the delignification is carried out in two subsequent steps. In the first mixer 2 both a high alkali addition and a high oxygen addition are made. This implies a charge of 25-50 kg alkali (NaOH) per ton pulp, preferably 25-35 kg/ton. This necessary alkali charge possibly can partially be obtained by a carry-over from the brown pulp washing. The charge in the mixer 2 then can be reduced in a corresponding degree. The oxygen charge shall be 25-50 kg/ton pulp, preferably 30-40 kg/t.

The temperature of the pulp at the feed into the reactor 3 shall be below 90°C, preferably 75-90°C. This implies that the reaction in the first step in reactor 3 can be carried out at the temperature of the pulp when it comes from the brown pulp washing. The staytime in reactor 3 shall be relatively short, 10-30 min, preferably 15-25 min.

The pressure in the first reactor 3 shall be 4-10 bar. The high pressure, combined with the high alkalinity of the pulp and the high oxygen charge, results in a high delignification speed. At the same time, the speed for the cellulose degradation is held on a low level, due to the relatively low temperature and short staytime.

After the first delignification step in the first reactor 3 the pulp is fed to the second delignification step in the second reactor 6. The temperature in the second reactor 6 shall be above 90°C, i.e. higher than in the first reactor 3. The difference in temperature

however, shall b less than 20°C, preferably 10-15°C. For bringing about the required increase in temperature, steam is supplied to the second mixer 5.

The pressure in the second reactor 6 shall be 2-5 bar and lower than in the first reactor 3. The staytime should be relatively long, 45-180 min, preferably 60-120 min.

The second delignification step foremost is a long extraction step where in relation to the first step the increased temperature and the extended staytime yield extended delignification. At temperatures above 90°C, thus, good extraxtion/leaching speed is obtained.

Due to the fact that no additional alkali is charged in the second step, not even for compensating for the consumption in the first step, the alkalinity of the pulp can be held relatively low in the second step. Hereby substantially cellulose degradation is avoided, in spite of high temperature and long staytime.

In the second mixer 5 possibly a small amount of oxygen can be added, which can be up to 5 kg/ton pulp. The oxygen charge in the first step can thereby be completed in order to increase the partial pressure of the oxygen.

The staytime in the second step is determined in relation to the temperature, in order to achieve optimum results, i.e. intended extended delignification without deterioration of the pulp properties. Higher temperature, thus, means shorter staytime.

The invention, of course, is not restricted to the embodiment shown, but can be varied within the scope of the invention idea.

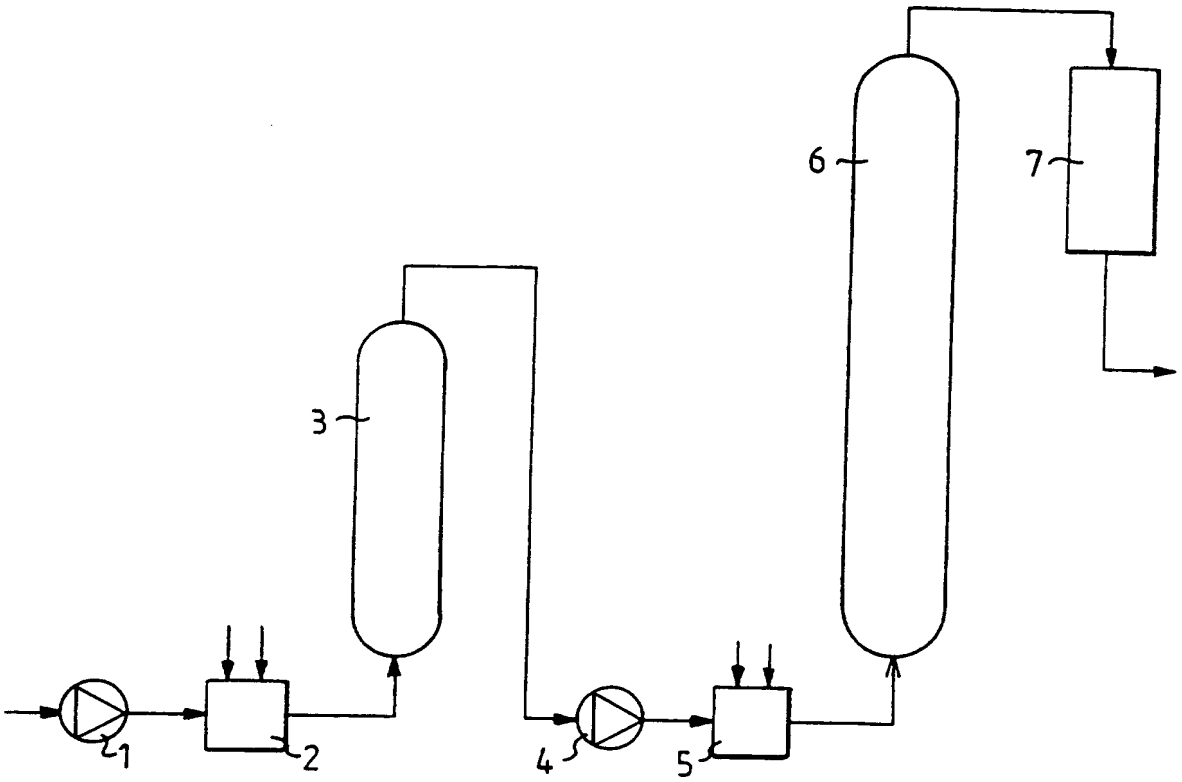
Claims

1. A method of oxygen delignification of pulp from lignocellulosic material at medium concentration in two steps, c h a r a c t e r - i z e d i n that an extended delignification is obtained in that the temperature in the first step is held below 90°C and in the second step above 90°C, that the difference in temperature between the steps is lower than 20°C, that the pressure in the first step is 4-10 bar and in the second step 2-5 bar, that the pressure in the first step is higher than in the second step, that the oxygen addition to the first step is high, 25-50 kg/ton pulp, that alkali is added only to the first step for obtaining a high alkalinity in the pulp, 25-50 kg alkali per ton pulp, and that the staytime in the first step is 10-30 min and in the second step 45-180 min.

2. A method as defined in claim 1, c h a r a c t e r i z e d i n that the temperature increase between the two oxygen steps is 10-15°C.

3. A method as defined in any one of the preceding claims, c h a r a c t e r i z e d i n that the staytime of the pulp in the first step is 15-25 min and in the second step 60-120 min.

4. A method as defined in any one of the preceding claims, c h a r a c t e r i z e d i n that additional oxygen is charged in an amount of 0-5 kg/ton pulp to the second step.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INTERNATIONAL SEARCH REPORT

International application No.
PCT/SE 96/01154

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: D21C 9/147
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: D21C

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	US 5217575 A (ÅKE BACKLUND), 8 June 1993 (08.06.93), column 2, line 67 - column 4, line 5 --	1-4
A	US 4946556 A (J. ROBERT PROUGH), 7 August 1990 (07.08.90), column 1, line 45 - line 56; column 2, line 61 - column 3, line 29 --	1-4

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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Date of the actual completion of the international search	Date of mailing of the international search report
16 December 1996	09 -01- 1997
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INTERNATIONAL SEARCH REPORT

Information on patent family members

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International application No.
PCT/SE 96/01154

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		FI-B,C- 91896	13/05/94
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